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स्वचल वाहन — मोटर सर्किट स्टार्टरों के लिए प्रतिरोधन—माप पद्धति

Indian Standard

AUTOMOTIVE VEHICLES — RESISTANCES IN STARTER MOTOR CIRCUITS — METHODS OF MEASUREMENT

UDC 621·313·13·049 : 621·317·332·3

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

November 1991

Price Group 1

Automotive Electrical Equipment Sectional Committee, TED 11

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Electrical Equipment Sectional Committee had been approved by the Transport Engineering Division Council.

While preparing this standard assistance has also been derived from SAE J-541 'Voltage Drop for Starting Motor Circuits'.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AUTOMOTIVE VEHICLES — RESISTANCES IN STARTER MOTOR CIRCUITS — METHODS OF MEASUREMENT

1 SCOPE

1.1 This standard recommends the maximum resistance in starter motor and solenoid circuits measured by volt-ampere method. It is applicable to cars, commercial vehicles and off-highway vehicles.

1.2 It does not apply to two wheeled vehicles and their three wheeled derivatives.

2 REFERENCE

The following Indian Standard is necessary adjunct to this standard:

IS No.	*Title*
IS 2465 : 1984	Cables for motor vehicles (*second revision*)

3 TERMINOLOGY

3.1 Main Circuit

The complete electrical circuit from battery to the starter main terminal and from starter to earth including resistance of contacts of battery isolator switch.

3.2 Solenoid Circuit

The circuit from the battery terminal to the starter solenoid terminal including the starter panel switch contacts and other relay contacts.

3.3 Voltage Drop

The voltage measured across any two specified points in a given circuit.

4 TEST REQUIREMENTS

4.1 The test equipment shall comprise of a dc-voltmeter (range 0-1 V) capable of reading accurately to 0·001 V and a dc-ammeter (range 0-100 A) capable of reading accurately to 2 A and a thermometer for measuring ambient temperature accurately to 0·5°C. The measuring equipment shall be of class 1 category.

4.2 The circuit for the measurement of voltage, current and resistance is shown in Fig. 1 and 2.

4.2.1 All the electrical joints shall be firm and without any loose contacts.

4.2.2 The cables shall be in accordance with IS 2465 : 1984.

4.3 Test Procedure

4.3.1 A current A_1 is passed through the positive circuit by using the battery. The voltage drop V_1 in the circuit between battery and starter is measured. The resistance R_1 is computed for this circuit (*see* **4.4.1**).

4.3.2 A current A_2 is passed through the starter-earth return circuit and voltage drop V_2 is measured. Resistance R_2 is computed for this circuit (*see* **4.4.2**).

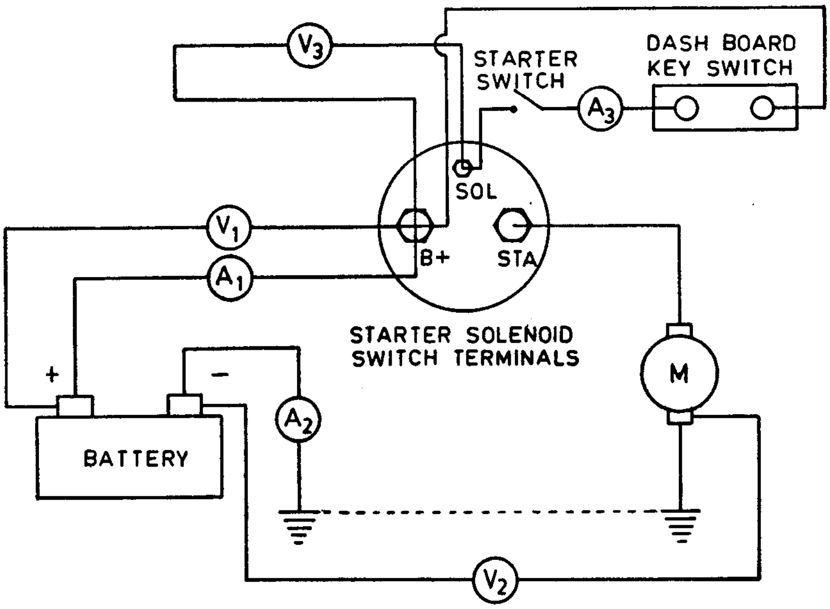

FIG. 1 CIRCUIT DIAGRAM FOR MEASUREMENT OF RESISTANCES

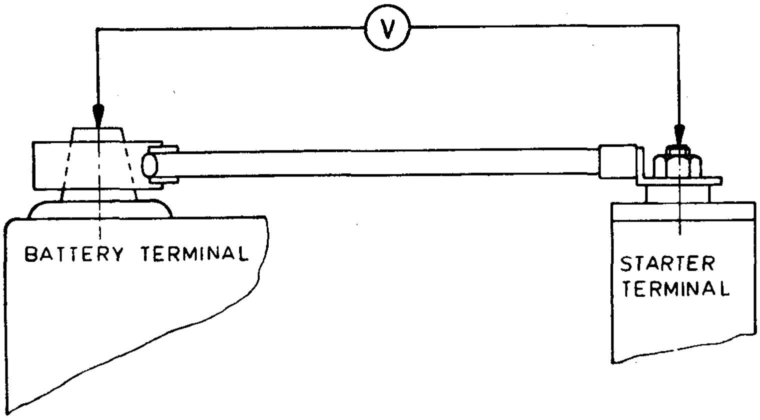

FIG. 2 MEASUREMENT OF VOLTAGE IN STARTER CIRCUIT

4.3.3 A current A_3 is passed through the solenoid circuit and the voltage drop V_3 is measured. Resistance R_3 is then computed for this circuit (*see* **4.4.3**).

4.4 Calculations for Resistances

4.4.1 *Positive Circuit*

Resistance in the circuit $R_1 = \frac{V_1}{A_1}$ ohms

where

A_1=current passed through the circuit, in amperes; and

V_1=voltage drop measured in the circuit, in volts.

4.4.2 *Starter-Earth Return Circuit*

Resistance in the circuit $R_2 = \frac{V_2}{A_2}$ ohms

where

A_2=current passed through the in circuit, amperes; and

V_2=voltage drop measured in the circuit, in volts.

4.4.3 *Solenoid Circuit*

Resistance in solenoid circuit $R_3 = \frac{V_3}{A_3}$ ohms

where

A_3=current passed through the circuit, in amperes; and

V_3=voltage drop measured in the circuit, in volts.

4.4.4 *Main Starter Circuit*

Total resistance in the main starter circuit

$$R = R_1 + R_2$$

4.4.5 The resistance in the main starter circuit and solenoid circuit shall be computed at 20°C using the following formula:

$$R_{20} = \frac{R_T}{1 + \alpha(T - 20)}$$

where

R_{20}=resistance at 20°C, in ohms;

R_T=resistance at T°C, in ohm;

T=ambient temperature, in °C; and

α=for copper is 0·004.

5 VALUES OF RESISTANCES

5.1 The resistances computed at 20°C in **4.4.5** shall not exceed the values specified in Table given below:

Type of Vehicles	*System Voltage V Volts*	*Resistance at 20°C, Max*	
		Starter Circuit	Solenoid Circuit
Passenger cars	12	0·002	0·07
Commercial vehicles	12	0·002	0·05
(up to 6*t*) and tractors	24	0·004	0·09
Commercial vehicles	12	0·001 7	0·05
(> 6*t* up to 10*t*)	24	0·004	0·09
Commercial vehicles	12	0·001 2	0·05
(⊁ 10*t* and off-highway vehicles)	24	0·001 7	0·09

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Headquarters :
Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75
Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :	Telephones
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW Delhi-110002	331 01 31 331 13 75
Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Maniktola CALCUTTA 700054	37 86 62
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	53 38 43
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